Hach sensION 156—DO, pH, Conductivity

METHOD SUMMARY

The Hach sensION 156 is a multi-probe, portable meter used for measuring temperature-compensated dissolved oxygen (DO), pH and conductivity.

SAMPLE HANDLING

The DO electrode requires about 26 ml of sample to cover all sensors when submerged in the 30-ml shell vials used for water quality measurements. Conductivity measurements require about 15 ml of sample. The pH electrode only requires about 5 ml of sample. Always allow samples to warm to room temperature before measuring. Measure pH if interstitial water within one hour of extraction.

METER

- To turn meter on and off, press the power key (**Φ exit**). The meter will start in the mode last used.
- The meter can only display readings from one electrode at a time. Toggle between electrodes to read different parameters.
- Meter is currently set to display integrated readings, requiring the user to press a key for each measurement. To display continuous readings, see manual.
- The meter is typically docked in its AC adapter, but can be run on AA alkaline batteries. Low battery level is indicated on screen.
- The gel-filled pH electrode has a dedicated port, whereas the DO and conductivity electrodes share a port, and must be exchanged when changing measurement modes. When electrodes are switched, the meter will prompt you to confirm the switch--press **ENTER** to do so.

CONDUCTIVITY ELECTRODE

The conductivity electrode measures temperature-compensated conductivity of aqueous solutions. The electrode should be calibrated before use (daily).

Equipment

Conductivity electrode
Probe holder
Kimwipes
Squirt bottle with DI water
Rinse tub
Conductivity standards—approximately 100, 1000, 10,000 µs/cm, at 25ºC
Gloves

To calibrate conductivity electrode

- Plug conductivity electrode into color-coded port, carefully aligning the pins with the meter. Turn on meter.
- Select an appropriate conductivity standard. Hach recommends the 1000 µS/cm standard for most measurements. It is best to calibrate with solutions at 25ºC. Use fresh standard sub-samples every month.
- Rinse and dry the electrode tip.
- Place the electrode in a subsample of the conductivity standard (do not contaminate stock), with sensors submerged. Agitate the probe to remove bubbles. Avoid contact with container.
- If meter is not in conductivity mode, press the **CON** button.
- Press **CAL**. Preferred units should be µS/cm. Use the number keys to change the conductivity value if needed.
- Press **ENTER**. If calibration is unsuccessful, see manual.

To read sample conductivity

- Place rinsed electrode in sample with sensors submerged. Swirl electrode in sample.
- Press **READ** button. Meter will display a stable reading in µS/cm or mS/cm.
- Rinse and blot electrode between samples.

To store conductivity electrode

Rinse and dry electrode with soft, lint-free cloth. Store dry in electrode holder attached to meter.

Quality control for conductivity measurements

Immediately after calibrating the conductivity electrode, take a measurement of 100, 1000 and 10,000 µS/cm standards. If the readings differ by more than 10% from expected values, recalibrate the electrode. Acceptable precision is 10% and acceptable accuracy is 5%. Record these measurements on data sheet.

DISSOLVED OXYGEN ELECTRODE

The DO electrode measures temperature- and pressure-compensated dissolved oxygen in aqueous samples. Salinity can also be compensated for by manually entering sample salinity. *The electrode should be calibrated at the beginning of measurement, and every two hours thereafter during measurement*.

The electrode relies on constant power to retain its polarization. If power to the electrode is interrupted

by a) interrupting AC or DC power to the meter or b) unplugging the electrode, the electrode will require repolarization. Repolarization requires 5 to 60 minutes, depending on duration of power interruption.

The electrode also relies on temperature consistency between the tip and the thermistor. Do not touch the thermistor, and ensure that is submerged during measurements.

Equipment and materials

DO electrode
Calibration and storage chamber
Kimwipes
Squirt bottle with DI water
Rinse tub
Stir bar and stir plate
Electrode mount for hands-free measurement

Preparation and calibration of DO electrode

- Plug DO electrode into color-coded port, carefully aligning the pins with the meter.
- Make sure that meter has been polarized for at least one hour.
- If meter is not in DO mode, press the **DO** button.
- Remove electrode from calibration and storage chamber without twisting. Carefully blot the electrode tip.
- Prepare the calibration and storage chamber by closing the bottom chamber and filling the top chamber with some water. Squeeze the bottom chamber to pull water into it. The top chamber should be empty and dry.
- Place electrode tip into top chamber and leave upright for about 10 minutes, allowing air to become water-saturated.
- Press **CAL**. The display will show **100%**.
- Press **ENTER**. If calibration is unsuccessful, see manual. Membrane may need replacement if damaged or calibration is unsuccessful.

To read sample DO

- Place rinsed electrode in electrode mount and lower into sample with sensors submerged.
- Stir sample vigorously with stir bar.
- Enter appropriate salinity compensation value. Press **SETUP** key, and toggle to *Setup 7*. Press **ENTER**. Use numeric keys to enter a salinity value from 0 to 42. Press **ENTER** to accept new value, or **EXIT** to leave value unchanged. You can do this once for a set of samples with similar salinities.

- Press **READ**. Meter will display a stable reading. Display should be in mg/L; if not, toggle between % and mg/L using the **DO** key.
- Rinse and blot electrode between samples.

To store DO electrode

Rinse and blot dry. Place in calibration and storage chamber and store upright with water in bottom chamber. Membrane should not be allowed to dry out.

Quality control for DO measurements

Check calibration and the beginning and end of measurements, and after every 10 samples, by measuring % saturation of air in the calibration and storage chamber (blot electrode and chamber, and wait 10 minutes for stable reading). If reading is not 100%, recalibrate. Record these measurements on data sheet.

PH ELECTRODE

The concentration of hydrogen ions, expressed as pH, can greatly affect toxicity test organisms. An acidic (low-pH) or basic (high-pH) can kill some organisms. Therefore, pH in test containers is measured at the beginning and end of bioassay tests to rule out interference of pH toxicity with test results.

The gel-filled pH electrode measures temperature-compensated pH of aqueous solutions. The electrode should be calibrated before use (daily). Only the tip of the electrode needs to be submerged, as all sensors are at the tip. For troubleshooting, see sensION 156 manual and pH electrode manual.

Equipment and materials:

pH electrode
Electrode storage solution and bottle (probe holder and cover for field use)
Kimwipes
Squirt bottle with DI water
Rinse tub
pH standards 7.00 and 10.00
Stir bar and stir plate
Electrode mount for hands-free measurement
Gloves, goggles, lab coat

To calibrate pH electrode

- Plug pH electrode into color-coded port, carefully aligning the pins with the meter. Turn on meter.

- Remove electrode from storage solution. Rinse and blot the electrode tip.
- Place the electrode in a subsample of pH standard 7.00 (do not contaminate stock), with sensors submerged. Stir standard.
- If meter is not in pH mode, press the **pH** button.
- Press **CAL**. **CAL** and an flashing **?** will appear, along with **Standard** and **1**.
- Press **READ**. The instrument will recognize the buffer and stabilize. If calibration is unsuccessful, see manual.
- When the reading stabilizes, **Standard 2** will appear.
- Rinse and blot the electrode.
- Place the electrode in pH 10.00 buffer with sensors submerged. Stir standard.
- Press **READ**. The instrument will recognize the buffer and stabilize. If calibration is unsuccessful, see manual.
- Press **EXIT** to accept the calibration after 2 points, then **ENTER** to save the calibration.
- Check calibration slope by pressing **REVIEW** and using arrow keys to toggle to **Slope and offset**.
- Measure pH of 7.00 buffer at beginning and end of measurements, and after every 10 samples. If pH is not within 10% of 7.00, recalibrate electrode. Record these calibration measurements on data sheet.

To read sample pH

- Place rinsed electrode in sample with sensors submerged. Stir sample.
- Press **READ** button. Meter will display a stable reading.
- Rinse and blot electrode between samples.

To store pH electrode

Rinse and blot electrode. For temporary storage (1-2 hours), store upright with sensors in pH 7 buffer. For overnight storage, store upright with sensors in electrode storage solution. For field use, electrode can be stored in the protective cot wetted with storage solution.

Quality control for pH measurements

Immediately after calibrating the pH electrode, take a measurement of the pH 7 buffer. If the reading is greater than 10% off, recalibrate the electrode. The pH 7 buffer should be read again in the middle and at the end of pH analysis (about every 10 samples). Recalibrate if the reading differs from 7.00 by greater than 10%. Acceptable precision is 10% and acceptable accuracy is 5%. Record these measurements on data sheet.